ANNUAL REPORT

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IDAHO FISHERY RESOURCE OFFICE

AHSAHKA, IDAHO

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Project Leader **Date**

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Cover Photo: (Back) Mark Bright, Temp. Fishery Biologist; Aaron Garcia, Fishery Biologist; Russ Waitt, Temp. Fishery Biologist; Jill Olson, Fishery Biologist; Ralph Roseberg, Fishery Biologist; Pat Bigelow, Fishery Biologist; (Front) Randy Bowen, Computer Assistant; Mike Faler, Assistant Project Leader; Chris Larsen, Temp. Fishery Biologist; Billy Connor, Fishery Biologist; Howard Burge, Project Leader; Ray Jones, Fishery Biologist; (Missing) Doug Burum, Temp. Bio Tech.

I. NARRATIVE

Introduction

The Idaho Fishery Resource Office (FRO) was originally established as the Dworshak Fisheries Assistance Office in 1981 and became fully operational in FY82. The name was changed to the Idaho Fishery Resource Office in 1991 as part of a region-wide change to better reflect the office's responsibilities and functions. In 1995 the Idaho FRO along with Dworshak NFH, Dworshak FHC, and Kooskia NFH were combined to form the Dworshak Fisheries Complex. On a larger scale we are also within the Columbia Basin Ecoregion of the Service's Region 1. The Idaho FRO is located on the grounds of Dworshak National Fish Hatchery, Ahsahka, Idaho, approximately 40 miles east of Lewiston, Idaho, on the mainstem Clearwater River. The Idaho FRO is staffed by nine full-time permanent employees and five full-time temporary employees. The primary purpose of the office is to assist in management and evaluation of fishery resources which relate to federal issues. Activities are primarily directed toward protection, restoration, and enhancement of anadromous fish resources in the Lower Snake River Basin.

Functions and projects include: evaluation and fishery management planning for the three federally operated hatcheries in Idaho, (Dworshak, Hagerman, and Kooskia NFHs); compilation of the information required to assess how each of the three hatcheries are meeting their established mitigation goals; providing assistance in designing studies to evaluate hatchery effectiveness and various management scenarios; developing databases for fisheries of national significance; acquiring data on spawning, rearing, and migration of the threatened Snake River fall chinook salmon; acquiring data on the use of supplementation to increase natural/wild populations of spring and fall chinook salmon in the Snake River Basin; and completing the field work on the project investigating the potential interactions of hatchery and wild steelhead in lower Clearwater River tributaries.

Besides the offices in the Dworshak Fisheries Complex, we work with a number of other Service offices in Idaho including Hagerman NFH, Lower Snake River Compensation Plan Office, and the Snake River Basin Office. We also work with several other Columbia Basin Ecoregion offices, and the Regional Office in Portland, Oregon.

In evaluating various fish management programs, we work closely with a number of cooperators including the USGS-Biological Resource Division (the agency formerly known as NBS), Idaho Department of Fish and Game, the Nez Perce Tribe, Washington Department of Fish and Wildlife, Idaho Power Company, Shoshone-Paiute Tribes, Shoshone-Bannocks Tribes, Oregon Department of Fish and Wildlife, National Marine Fisheries Service, U.S. Forest Service, U.S. Army Corps of Engineers, Bonneville Power Administration, Battelle Pacific Northwest Labs, and Pacific States Marine Fisheries Commission.

Station Operations

1. Density Index Evaluation for Steelhead at Dworshak NFH

Investigations of steelhead length frequency distributions were continued FY97. A review of the literature revealed that rainbow trout are territorial and set up dominance hierarchies. This behavior results in more size variability with dominant and subordinate individuals. However, at higher densities the establishment of these hierarchies can be depressed and individual growth rates are much more uniform. Currently, steelhead at Dworshak NFH are transferred from indoor nursery tanks to outside rearing facilities at an average size of 100 fish per pound. Density Indices (DI) in the nursery can reach as high as 0.6 or 0.7 by the time of transfer. Steelhead are usually ponded into Burrows ponds at double the final rearing number and are split at the time of adipose fin clipping. At ponding, the DI is about 0.1 and gradually increases to about 0.35 by the time smolts are released in April. The dramatic decrease in DI from the nursery to outside rearing could be partially responsible for the development of wide length frequency distributions.

Based on our literature review, we decided to conduct a short pilot study. In June of 1996, a total of 160,364 BY96 steelhead were transferred outside from the nursery. A sample of 225 fish was collected and individual lengths were recorded to establish a baseline length frequency distribution. Equal numbers of fish were then split into three separate raceways, one control and two treatments. Fish in the control raceway were allowed to use the entire raceway, resulting in an initial ponding DI of 0.15. Screens were installed in the two treatment raceways so that fish were restricted to the upper third of the raceway, resulting in an initial ponding DI of 0.43. Density Indices in all raceways were adjusted so that the DI never exceeded 0.5.

The DI in the treatment raceways reached nearly 0.5 by July 1, 1996. The DI in the control raceway had increased only slightly to 0.17. The DI in the treatment raceways were decreased to 0.23 by moving the screens so that 2/3s of the raceways were available. Length frequency information was collected for each of the three raceways. There did not appear to be any major differences between any of the three raceways although the length frequency distributions for each had become somewhat wider.

By September 8, 1996, the DI in the treatment raceways had reached 0.5 while the control raceway had reached 0.36. Length frequency data was again collected and showed that the average fish size in the treatment raceways was similar to the control raceway. However, the length frequency distribution was slightly wider in the treatment raceways. Later in September, all the fish were adipose fin clipped and split into adjacent raceways where fish had access to 2/3s of the raceway. The DI for the control and treatment raceways decreased

to 0.19 and 0.25, respectively. The length frequency distributions were wider in September compared to August.

In April 1997, the DI in the treatment raceways reached 0.38 and the DI in the control raceways reached 0.36. No noticeable differences were observed in the length frequency distributions for any of the treatment or control raceways.

Increasing the density index of summer steelhead reared in conventional hatchery raceways in an effort to reduce the development of wide length frequency distributions was not successful in our experiment. This does not mean that increased rearing density for steelhead will not reduce length frequency distributions, only that it was not successful in the way we tried to do it. There are a number of possible factors that could be responsible for our results. Our densities may not have been maintained high enough for long enough periods in order to continue any possible inhibitory effects on the social hierarchy that may have been going on. The configuration of the raceways did not allow a very gradual decrease in DI over time. For example, when the DI in the treatment raceways reached 0.5 in July and the screens were removed to allow the fish access to two thirds of the raceways, DI decreased by one half to 0.23. Such a large decrease in DI may have interrupted any possible inhibitory effects on social hierarchy that may have been going on at the higher DI. A final report is scheduled for completion by early summer 1998.

2. Sequential Release Evaluation for Spring Chinook Salmon

In the past, spring chinook smolts at Dworshak NFH were generally released the last part of March or first part of April. Preliminary smolt assessment data indicated that smolts at Dworshak NFH may not be fully developed at the time of release. Therefore, our office in coordination with Dworshak NFH, Kooskia NFH, and Dworshak FHC, designed a project to evaluate the effect of time of release on smolt survival to Lower Granite Dam and on the rate at which adults return from the ocean for three brood years of spring chinook salmon. In 1992, three groups of BY90 chinook were released from Kooskia NFH on April 7, April 21, and May 5, respectively. In 1993 and 1994, three groups were released from Dworshak NFH on April 8, April 22, and May 6, respectively. Based on PIT-tag information, we observed that smolts released later generally migrated faster. However, migration rate did not appear to affect juvenile survival.

Adult returns for all three release years are now complete. Preliminary coded-wire tag data analysis of adult returns indicates that the groups released earlier had better returns than the later release groups, despite the fact that the later groups had faster migration rates as smolts. Final data analysis is in progress and a final report is scheduled for completion by early summer 1998.

3. Erythromycin Field Trials for Spring Chinook Salmon

Spring chinook salmon at Dworshak NFH have had a chronic problem with bacterial kidney disease (BKD). Although BKD has recently not been as severe as in past years, the problem persists. Feeding erythromycin to control BKD has been practiced at Dworshak NFH but has never been fully evaluated.

Since 1993, the Hatchery Evaluation Team (HET) for the Dworshak Fishery Complex has been actively engaged in conducting field trials under INAD 4333, designed to generate data on the efficacy of feeding erythromycin to spring chinook salmon at both Dworshak and Kooskia NFHs. Treatment groups were set up in 1993 to compare: (1) the efficacy and palatability of gallimycin 50-P to a proposed new formulation of 22 percent erythromycin in a wheat germ carrier; (2) administering the treatment for 21 days versus 28 days; and (3) the efficacy of two treatments versus three treatments. These groups were released in April 1994. In 1994, treatment groups were set up to compare: (1) administering the treatment for 21 days versus 28 days; and (2) whether, as a second treatment, a fall treatment would be more effective than a spring treatment prior to release. In addition, we included, for the first time, true control groups that did not receive any erythromycin during rearing. All these groups were released in April 1995. In 1995, treatment groups were set up to determine: (1) if administration of erythromycin before fish handling during marking operations provides them some level of protection; and (2) administration of erythromycin just before fish are released provides protection during emigration and seawater entrance. These groups were released during April 1996.

All treatment groups were PIT tagged and coded wire tagged to evaluate emigration performance and adult returns. Further, representative groups were also transferred to Marrowstone Field Station for extended saltwater rearing trials. Preliminary data on emigration performance and extended saltwater rearing for all three release years have been completed. All treatment groups released in 1994 had similar interrogation rates. In 1995, similar results were observed, but interrogation rates were somewhat higher than the previous year. All groups in 1995 had cumulative interrogation rates above 60% to Lower Granite Dam. The control groups released in 1995 that received no erythromycin treatment had the second highest interrogation rate of 66%. Interrogation rates for the 1996 releases were lower than in 1995. No noticeable differences were observed in interrogation rates between treatment groups released at Kooskia NFH. However, the groups at Dworshak NFH that received two feedings of erythromycin had lower interrogation rates than the groups that received only one feeding. The Dworshak Fish Health Center is currently compiling on station results and will include results from extended saltwater rearing trials which have not been completed yet. Our station is providing analysis of PIT-tag and coded-wire tag data. The final report will not be completed until the last adult returns are completed in 1999.

4. Retention Rate of Numbered TYVEK Tags Attached to the Operculum of Adult Spring Chinook Salmon at Dworshak National Fish Hatchery

Since 1993, we have been evaluating various types of tags to mark adult spring chinook salmon as they return to the hatchery. In 1996, in conjunction with the Idaho Department of Fish and Game, we completed evaluating the use of small numbered TYVEK tags attached to the operculum. Dworshak stock fish had the tags attached to the right operculum; Kooskia stock fish had the tags attached to the left operculum. Tags were attached using two 3/8" stainless steel staples applied with a hand-held staple gun. The opposite operculum was punched with a hand-held paper punch to ensure identification of tagged fish if tags were lost. Tags were constructed of #1085 TYVEK, 22 mm in diameter, white, and numbered with black waterproof ink. Letter codes on the tags identified the fish stock.

Operculum punches were effective marks for stock identification, even on fish where the wound had regenerated. Regenerated operculum punches were characterized by dark discoloration on the wound. For fish that lost tags, this mark was 100% effective for identifying the stock.

A total of 1,108 adult spring chinook salmon were tagged using TYVEK tags. Six hundred and sixty-one males were tagged, primarily I- and II-Ocean fish. Four hundred and fourteen females were tagged, almost all were II-Ocean fish. Only thirty-three of the tagged fish could not be definitively sexed because of loosing the tag before the fish was spawned. At the end of spawning, a total of 1,105 of the tagged fish were accounted for and were used in the analyses. Three tagged fish were never recovered or accounted for and were not included in the analyses. Sex was not determined for 1 pre-spawning mortality that lost its tag.

A total of 973 fish retained their tags for an overall tag retention rate of 88.1%. A total of 132 fish lost their tags. Tag loss was minimal until we started handling fish regularly for spawning which began on August 20. On July 29, all chinook salmon on station (914) were injected with Erythromycin as a preventative measure against bacterial kidney disease. Tag retention on July 29 was 100%, although several fish had loose tags which were replaced. A total of 920 chinook had been tagged by August 20. Twenty-five pre-spawning mortalities were recovered during this time period; only 1 fish out of 920 (0.1%) had lost its tag by August 20. .

Spawning started on August 20 and was conducted every 3 or 4 days. The last spawning take was on September 24, 1996. Tag loss was separated into two categories: pre-spawn mortality tag loss and spawning tag loss. A total of 131 fish lost tags after August 20. Of these fish, 61 were pre-spawn mortalities. Although the overall rate of tag loss for pre-spawn mortalities during this time period was 36.3%, very few missing tags were observed until Spawning Take

Number 8 (9/17). Even more interesting is the fact that most of the mortalities that had missing tags were males, 58 out of 62 or 94% . Forty-three of those males were I-Ocean (74.1%). Only 3 female pre-spawn mortalities were recovered without an operculum tag. Seventy adults that were spawned had missing operculum tags. The overall tag loss rate for spawned fish during this time period was 7.6%, and again, large numbers of missing tags did not begin showing up until Spawning Take Number 7 (9/12). Similar to the pre-spawn mortality record, most of the tag loss on chinook that were spawned occurred on males, 63 out 70 or 90%. Out of 70 fish that lost tags, only 7 (10%) were females. Of the 63 males that lost their operculum tags, 41 (65%) were I-Ocean fish.

TYVEK operculum tags worked better than previous types of external tags evaluated to date at Dworshak NFH. The tag's attributes include minimal damage to the fish, ease of application, speed of application, low cost, and tag readability. Tag retention was excellent until the fish were handled frequently during spawning operations. Protocol for spawning called for every fish to be examined for ripeness during each spawning take. Since spawning takes were only 3 or 4 days apart, fish were handled continually over a one month time period. The I-Ocean male component of the run appeared to be the most susceptible to tag loss. Sixty-three percent of the total tag loss was attributed to I-Ocean males. Higher tag loss for the smaller fish is not unexpected since the operculum is thinner on smaller fish. In addition to tag loss, other problems associated with the tag included algae growth on the tag and the edges of the tag tended to roll up and obscure the number. These two factors could potentially slow fish handling activities since additional time would be required to read the tag.

5. Evaluation of Nutritional Enhancement and Growth Rate Manipulation of Steelhead to Increase Smoltification

In the summer of 1997, we developed a proposal to evaluate the effects of nutritional enhancement and altered feeding strategies on the parr-smolt transformation of summer steelhead (*Oncorhynchus mykiss*) at Dworshak National Fish Hatchery. The goal of this project is to significantly decrease the number of summer steelhead (*Oncorhynchus mykiss*) produced at Dworshak National Fish Hatchery that residualize in the river and fail to migrate to the ocean as smolts after being released. The study is a cooperative effort between the Dworshak Fisheries Complex, the Lower Columbia River Research Laboratory (USGS-BRD), Abernathy Salmon Culture Technology Center, Marrowstone Field Station (USGS-BRD), and the Moore-Clarke feed company. Pilot work commenced in the summer of 1997 with several Burrows ponds set up with experimental treatments and controls. The project is designed to monitor physiology associated with the parr-smolt transformation during hatchery rearing, during the smolt out-migration period to the ocean, and during simulated saltwater entry. Smolts will be marked with PIT tags so that

migration time and survival can be estimated after release. Also, PIT tagged fish will be re-sampled at Lower Granite Dam to compare development of smoltification after in-river migration with conditions at the hatchery prior to release. Samples of about 75 fish from each treatment and control will be transferred to Marrowstone Field Station for extended salt water rearing. These data will be used to evaluate differences between treatments and controls under simulated saltwater entry conditions.

Baseline data was collected in October 1997. Lengths and weights of about 100 fish have been collected from each pond monthly to monitor growth and condition. Two experimental ponds were placed on a reduced growth rate for December and January to simulate conditions in the wild. The ponds will be put on an accelerated growth schedule in the spring. Two other experimental ponds will receive a 6-week feeding of a diet formulated by Moore-Clarke that is designed to facilitate the transfer of smolts from freshwater to saltwater. The treatment will be given about 6 weeks prior to release in late April 1998. The other experimental ponds started receiving a modified Abernathy steelhead diet in November. These ponds will be compared to controls fed the standard Hagerman diet.

6. An Evaluation of Adipose Fin Clip Versus Left Ventral Fin Clip as Mass Marks for Hatchery Spring Chinook Salmon at Kooskia NFH, Idaho

In 1993, we conducted an evaluation for adipose fin clip versus left ventral fin clip as mass marks for hatchery spring chinook salmon at Kooskia NFH. The experiment was set up with 349,377 juvenile spring chinook salmon divided among 12 separate raceways. The raceways were divided into two treatment groups of six contiguous raceways each, an adipose fin clip group and a left ventral fin clip group. To compare adult returns between treatment groups, all fish in the experiment were marked with coded-wire tags. All the fish in each treatment group were fin clipped at the time they were marked with coded-wire. Post-release survival to Lower Granite Dam was determined by marking 600 fish in each treatment group with Passive Integrated Transponder (PIT) tags. An estimate of minimum survival to Lower Granite Dam was obtained by accumulating the unique PIT-tag interrogations at Lower Granite, Little Goose, and McNary dams.

Of the nearly 177,000 coded-wire tagged fish marked with the adipose fin clip, only four tagged adults were recovered, three II-ocean fish and one III-ocean fish. Of the nearly 173,000 coded-wire tagged fish in the left ventral fin clip group, only three tagged adults were recovered, one I-ocean fish and two II-ocean fish. The percent returns for these two groups were 0.00225 and 0.00173, respectively.

There was no significant difference in post marking mortality between the two fin clip groups (P=0.411). Cumulative interrogation rates for adipose and left

ventral fin clipped treatments were 47% and 43%, respectively. No significant differences were observed in interrogation rates between raceways within treatment groups or between treatment groups. No significant differences in mean migration times to Lower Granite, Little Goose, or McNary dams were observed between groups.

We found no significant differences in pre-release or post-release mortality or in migration rate to lower Snake River dams for groups of juvenile spring chinook salmon marked with a left ventral fin clip versus an adipose fin clip. The results of this paper are similar to previously published research although not all the literature is in agreement. Only two of the previously published papers evaluated adult returns for anadromous fish and each came to different conclusions. Our results suggest that either adipose or left ventral fin clips can be used for mass-marking spring chinook salmon with no difference in overall performance of juvenile fish. We did not recover sufficient numbers of adults from the study to reach conclusions about the effects of fin clipping on adult returns. Results of this study should be considered preliminary; several years of data should be evaluated before large-scale changes in mass marking are undertaken based on these results.

7. Dworshak, Kooskia, and Hagerman Hatchery Evaluation Teams

The Dworshak Hatchery Evaluation Team (HET) met six times during the year. Major issues and activities that were handled by the Team included: Coordination of the BY97 steelhead and spring chinook spawning seasons and development of pilot study to evaluate effects of enhanced diets and growth rates on steelhead smoltification.

The Hatchery Evaluation Team for Hagerman NFH held 4 meetings during FY97. Team members include participants from Hagerman NFH, Idaho Department of Fish and Game, Dworshak Fish Health Center, and our office. Accomplishments for FY97 include: completion of a 5 year operation plan for the hatchery; information exchange with other Hagerman Valley and Salmon River drainage hatcheries; discussion of fish health issues; coordination with Idaho Department of Fish and Game and University of Idaho, Hagerman Fish Culture Experiment Station; and initiation, implementation, review, or analysis of various studies being conducted at Hagerman NFH. These studies include evaluating acclimation, size at release, volitional release, fin quality diet, and intermittent versus reduced feed rearing strategies.

8. PIT-Tagging Operations

During 1997, personnel from the Idaho FRO PIT tagged a total of 36,742 juvenile fish. Beginning in February, 14,148 spring chinook salmon were tagged at Dworshak Fisheries Complex and 4,096 spring chinook salmon were tagged at Kooskia National Fish Hatchery for the region-wide Hatchery PIT-tag study.

In early April 9,998 fall chinook salmon were tagged at the Nez Perce Tribe's Pittsburg Landing Acclimation Facility as part of the ongoing supplementation and survival study involving the Service, the Nez Perce Tribe, and the National Marine Fisheries Service. Coded wire and elastomer tag retention and data was also collected for the Washington Department of Fisheries.

In mid April 600 summer steelhead were marked at Dworshak Fisheries Complex for off-site release into Clearwater River tributaries. An additional 2,700 summer steelhead trout were marked for on-site release. Both groups of fish marked were a final wrap up of the Clearwater River steelhead interaction study. An additional 1,500 steelhead were also marked for the Fish Passage Center.

In late April, 1,200 steelhead were tagged and ATPase samples taken for the Lower Columbia River Research Laboratory, U.S.G.S. ATPase Density Index study.

We also fulfilled a request from the National Marine Fisheries Service for marking of 2500 spring chinook salmon as a test group for experimental 130 MHz ISO PIT tags. Personnel from the Pacific Marine Fisheries Commission office were present during marking to test the suitability of an experimental portable tag reader. This group of fish was subsequently transported to Lower Granite Dam for release into the juvenile bypass system to test the experimental tag detection equipment.

9. Idaho Supplementation Study

We conducted work on our spring chinook supplementation project in cooperation with the Idaho Supplementation Studies (ISS) program. Participants in ISS include IDFG (lead agency), FWS, Nez Perce Tribe, and Shoshone-Bannock Tribe. Our office is looking at Clear Creek, a tributary of the Middle Fork Clearwater River, and Pete King Creek, a tributary of the Lochsa River, to evaluate impacts of hatchery produced smolts and or parr releases. This year we began selecting broodstock for second generation hatchery and natural offspring on Clear Creek. Progeny from these adults will be given an external mark, to differentiate them from general production fish, and reared to smolt at Kooskia NFH.

In 1997, ten segments on Pete King Creek (parr supplementation) and 18 segments on Clear Creek (smolt supplementation) were snorkeled and the substrate surveyed according to established protocol. The 1997 juvenile spring chinook counts in Clear Creek were up considerably from 1996. In Pete King Creek the counts were down from 1996. In 1997 there were no supplementation releases in Pete King or Clear creeks.

We trucked and released 127 spring chinook salmon adults on Clear Creek; 28 had radio transmitters implanted in their stomachs. We tracked these fish to determine where they went after release. We found the majority of fish remained within four miles of their release site. At least five adults moved out of

Clear Creek into the Clearwater River. We recovered and or accounted for 20 of the 28 transmitters.

Two redd and adult spawner surveys were conducted in Clear Creek and one in Pete King Creek. We located 17 redds, 20 live adults, and 54 carcasses during our surveys on Clear Creek. Four live adults and one redd were observed in Pete King Creek. This is the first year that we have seen adult spring chinook and or redds in Pete King Creek.

We PIT tagged 302 naturally produced spring chinook salmon parr in 1997. Electrofishing activities yielded 299 spring chinook salmon. Three were captured using the rotary screw trap. All fish were captured in the lower 11 miles of Clear Creek. Logging operations precluded us from working in the upper reaches.

10. Juvenile Fall Chinook Studies

During FY97 we: 1) monitored and evaluated yearling releases of Lyons Ferry fall chinook salmon into the Snake River; 2) conducted supplementation/survival research using Lyons Ferry Hatchery subyearling fall chinook salmon released into the Snake River; 3) documented natural subyearling fall chinook salmon life history timing and survival; and submitted three manuscripts to journals of the American Fisheries Society. Hatchery yearlings traveled rapidly downstream and survived to the tail race of Lower Granite Dam at a rate higher than that for subyearlings. Lyons Ferry Hatchery subyearling fall chinook salmon released earlier in summer survived better than those released later. Survival was higher for larger hatchery subyearlings than smaller fish. Natural fall chinook salmon produced in the Snake River upstream of the Salmon River confluence emerged earlier and migrated seaward earlier than fish produced downstream of the Salmon River confluence. As in past years, earlier emigrating naturally produced fish survived to the tail race of Lower Granite Dam better than later emigrating fish. The above work was funded by the Bonneville Power Administration. Cooperators in FY97 included the Idaho Power Company, USGS-Biological Resource Division (the agency formerly known as NBS), National Marine Fisheries Service, Nez Perce Tribe Department of Fisheries Resource Management, University of Idaho, and the Washington Department of Fish and Wildlife.

11. Fall chinook salmon redd searches

A total of 206 fall chinook salmon redds were counted in the Snake River and tributaries above Lower Granite Reservoir in 1996. This breaks down to 113 redds in the Snake River (71 counted from the air and 42 using underwater video), 69 in the Clearwater Basin, 20 in the Grande Ronde River, three in the Imnaha River, and one in the Salmon River. The 113 redds counted in the Snake River in 1996 compares to 71 counted in 1995, 67 in 1994, and 127 in

1993. The 68 redds counted in the Clearwater Basin compares to a range of four to 37 counted annually since 1988. Although the number of redds observed in the Clearwater Basin was higher than past years, the overall percentage of redds counted in Snake River tributaries in 1996 (45%) was similar to the 38%-44% observed in the past four years.

Based on redd counts, spawning in the Snake River started about same time as the previous three years (1993-1995). However, redd counts tapered off two to four weeks earlier than the previous five years. This was partially due to reduced effectiveness in observing redds caused by an increase in flow and turbidity in mid-November.

12. Radio-tracking adult fall chinook salmon

In 1997 we started work on a radio-telemetry project designed to determine the spawning distribution of fall chinook salmon released as juveniles in the Snake River and tributaries above Lower Granite Dam. Yearling fall chinook salmon are scheduled to be released at three different locations above Lower Granite Dam from 1996-1998 in an attempt to increase natural production. From 1997-2001, IFRO personnel in cooperation with the Nez Perce Tribe, Washington Department of Fish and Wildlife, University of Idaho, National Marine Fisheries Service, and U.S. Geological Service, plans to radio-tag adult fish that return from these releases. Through a network of fixed tracking stations, and through mobile tracking, the movements and spawning location of each radio-tagged fish will be determined. The spawning locations of fish from the same release location will be grouped and compared. The success of releasing juvenile fall chinook salmon will be gauged in part on whether or not fish released as juveniles spawn near their respective release locations, and in areas normally used by fall chinook salmon.

In FY 1997 we prepared to tag and track adult fall chinook salmon. We assembled fixed tracking stations at five locations, three on the Snake River, and one each on the Salmon and Clearwater rivers. In addition, we obtained used radio tags from the University of Idaho, and borrowed telemetry receivers from the U.S. Geological Service. We also worked with the National Marine Fisheries Service in setting up a tagging protocol, and the Nez Perce Tribe and Washington Department of Fish and Wildlife in planning mobile tracking strategies and schedules.

13. Interactions of hatchery and wild steelhead in the Clearwater River of Idaho

We continued to collect data for the fourth year of study on hatchery release aspects of the project. Other aspects of the study, included in past years but not 1997, were monitoring natural emigration, monitoring adult returns to one of our major tributaries downstream of Dworshak NFH, sampling for hatchery and natural steelhead in Clearwater tributaries downstream of Dworshak NFH, and

natural steelhead densities, genetics and fish health sampling in the 5 study tributaries.

To assess optimum size-of-release for minimizing straying and maximizing survival, 3,496 Dworshak NFH steelhead were PIT tagged. The Dworshak NFH PIT-tagged samples were stratified by 3 times of spawning, 3 size-at-release groups, and 3 release sites. As was true in 1994, 1995, and 1996, small steelhead were detected at downriver dams significantly less than either medium or large steelhead. Steelhead less than or equal to 180 mm fork length were detected at the rate of 65%; whereas, 84% and 87% of the medium (>180 mm and $\leq$200 mm) and large (>200 mm) steelhead were detected. Travel time and survival estimates to downriver dams for steelhead equipped with PIT tags will be correlated with in-river temperature and flow conditions over the four year period. This information will be released in a final report for the project.

A second interim project report, summarizing 1995 data, was completed and distributed this year. Major findings are summarized below. For the complete report, please contact our office.

Population density estimates were completed for Big Canyon, Bedrock, Cottonwood, Jacks, and Mission creeks during mid summer under low water flow. Overall, average mid-summer densities of subyearling and yearling steelhead were lower than densities observed in the early 1980's by Kucera and Johnson (1986). Subyearling densities were higher in 1995 than those observed during 1994 by Witty (1995). Yearling densities observed in 1995 were higher in Bedrock and Cottonwood creeks and lower in Big Canyon Creek than those observed during 1994 by Witty (1995).

Approximately 200 wild steelhead, yearling and sub-yearling, were collected from the five creeks for genetic comparisons with Dworshak NFH steelhead. Electrophoretic analysis on these fish is currently being completed by the National Marine Fisheries Service on these fish. Results of the genetic analysis will be presented in the final project report. Past data have indicated interbreeding between wild and hatchery steelhead would be discernable electrophoretically, if it were occurring.
The health status of wild and hatchery steelhead were evaluated using an organosomatic index and a quantitative health assessment index (HAI). Fish were examined externally and internally, and tissue samples were taken to test for pathogens. Hatchery steelhead had higher HAI values compared to wild steelhead primarily because of a high prevalence of environmental gill disease and dorsal fin erosion. Both wild and hatchery fish were infested with several protozoan ectoparasites. The prevalence and levels of infection with antigen of *Renibacterium salmoninarum* was higher in wild steelhead than in hatchery steelhead, but neither stock had clinical signs indicative of bacterial kidney disease or any other systemic bacterial infection. No viral pathogens were

detected in cell culture assays from either wild or hatchery steelhead. Saltwater challenges, performed on Dworshak B-run steelhead just prior to being released from the hatchery, were used to evaluate the level of smoltification at the time of release from the hatchery. Results thus far indicate that most fish were not fully smolted at time of release. Steelhead ≤180 mm fork length (FL) suffered higher rates of mortality and did not regulate plasma sodium as well as fish >180 mm FL.

The Dworshak NFH steelhead were again PIT tagged. Samples were stratified by 3 times of spawning, 3 size-at-release groups, and 3 release sites. We found no differences in numbers of steelhead detected at downriver dams based on time of spawning time (P=0.21) or release site (P=0.27). However travel time to Lower Granite Dam, on the Snake River, was significantly faster for steelhead from the mid egg take. This finding was true in 1994 also. Smaller steelhead (<180 mm FL) were detected at downstream dams less frequently than those in the medium and large size categories (180 mm - 200 mm and >200 mm FL; P=0.00). Other factors which need to be considered, such as in-river conditions, detection efficiency, fish health, and rearing system, will be addressed in the final report.

In order to analyze straying rates and survival of strays and wild fish to Lower Granite Dam, sampling was conducted in the lower portions the five study tributaries biweekly from just prior to release of Dworshak NFH fish to the end of July. Five hundred forty seven fish collected in these creeks were PIT tagged and released. Seventy three percent (399 steelhead) were stray hatchery fish. Of the hatchery steelhead captured in the tributaries, 74% were small, 21% were medium, and 5% were large (as defined above). Spot sampling in the creeks during the summer found stray hatchery steelhead as much as 8 km upstream from the stream's confluence with the Clearwater River. Stray hatchery steelhead were also found in upper sites of Bedrock Creek during density sampling conducted in late July, early August. This compares to 44 (19%) stray hatchery and 186 (81%) wild steelhead sampled in tributaries during 1994. Hatchery steelhead sizes in 1994 were: 84% small, 11% medium, and 5% large. (Only three creeks were sampled over a shorter time frame in 1994).

A rotary screwtrap was operated on Big Canyon Creek (March 9 through June 14) to monitor wild emigration. A total of 2,440 wild and 122 hatchery steelhead were captured. Of these, 799 wild and 53 hatchery steelhead were PIT tagged so that their emigration could be monitored. Also, an adult weir was operated during weekdays on Big Canyon Creek from early April through mid June. Nine hatchery and 2 wild adult steelhead were captured and released.

The final report, encompassing all 3 years of data for this project, plus the fourth year of data on Dworshak NFH releases, will be completed in FY 1998. Cooperators are Idaho Fishery Resource Office, Dworshak NFH, Dworshak Fish

Health Center, and The Nez Perce Tribe. Genetic analysis is again being completed by the National Marine Fisheries Service at no cost to the project.

14. Fish and Wildlife Coordination Act Report for Lower Snake River Juvenile Salmon Migration Feasibility Study

The U.S. Fish and Wildlife Service is currently under contract with the Army Corps of Engineers (Corps) to prepare a Fish and Wildlife Coordination Act Report for the Lower Snake River Juvenile Salmon Migration Feasibility Study. This report, addressing impacts of three major study alternatives to fish and wildlife resources, will be incorporated into the Corps' Environmental Impact Statement. The Columbia River Fishery Program Office (Vancouver, WA) and the Eastern Washington Ecological Services Office (Moses Lake, WA), will be addressing anadromous fish and wildlife issues. Our office will be addressing resident fish issues.

The three alternatives being evaluated are: the existing juvenile migration system, including already scheduled improvements; as of yet undefined improvements to the current system; and permanent near-natural drawdown. Already scheduled improvements to the existing system include more trucks, barges, and flow deflectors. The improved system option would find ways to improve fish guidance efficiency, forcing a higher percentage of juveniles to be removed from the river and transported. Changes to turbines, allowing 'friendlier' passage, is another possibility. Permanent drawdown would be accomplished by removing the earthen section of the dams, allowing the river to be free flowing.

Literature review and compilation of past and current research concerning resident fish in the Snake River basin is underway. Contacts have been made with U.S. Geological Survey, Nez Perce Tribe, CRITFC, CBFWA, and other Fish and Wildlife Service offices. Entities yet to be contacted include Washington Department of Fish and Wildlife, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and other concerned tribal authorities. A draft report is due by September 1998.

15. ESA Listing Activities Associated with Bull Trout

IFRO provided expertise and staff time in all ESA listing activities associated with bull trout during FY 1997. We assisted in the development of the 1994 reconsidered finding in accordance with the November, 1996 ruling of the Oregon District Court, and worked closely with Regional staff in the development of the proposed rule that followed. We provided technical representation at the public hearings associated with the proposed rule in Spokane, Missoula, and Boise. In addition, our staff developed responses to all written comments and public testimonies associated with the Snake River Basin that resulted from the hearings and public comment period.

In response to the reconsidered finding, the original petitioners filed a new lawsuit claiming that the Services' establishment of 5 Distinct Population Segments and the

Findings associated with them were arbitrary and capricious. Our staff worked closely with the DOJ trial attorney assigned to the case in preparation of legal briefings for the Judge and the Plaintiff's attorneys.

We also participated in the team established to prepare the 1997 final rule for bull trout listing, and collected pertinent new information for inclusion into the administrative record. Our staff developed the status, distribution, and threat analyses for bull trout in the Snake River Basin in association with the 1997 effort.

16. Bull Trout Recovery Efforts

IFRO staff are part of the Clearwater Basin Technical Advisory Team (TAT) for bull trout restoration in the Clearwater and Lower Salmon River basins. This group is a multi-agency team that was formed as a result of Governor Batt's Bull Trout Conservation Plan, and is responsible for providing technical assistance to the Basin and Watershed Advisory Groups for the Clearwater River Basin.

17. Occurrence and Distribution of Contaminants in the Columbia River

Our office provided assistance to the BRD-USGS Biomonitoring of Environmental Status and Trends (BEST) program. The objectives of the study were to document the occurrence and distribution of contaminants in the Columbia River drainage and evaluate the risk these contaminants pose to biota, to quantitatively evaluate the performance of indicators selected for use in aquatic habitats by the BEST program, and to evaluate the potential for collaboration with the NASQAN II and other programs of USGS. Our responsibilities were to provide logistical and technical fisheries support to the sampling team for collections at three different locations in the Snake River drainage in Idaho. Idaho FRO staff obtained the appropriate biological sampling permits, endangered species permits, located suitable sampling sites, and made arrangements for access to the sites and processing locations. Additionally, we provided personnel and equipment for collecting the targeted predator and bottom feeding fish species to be used for necropsies and fish health exams.

18. Fish Run Data

Spring chinook salmon and steelhead run summaries (see Appendices A and B, respectively) and prediction information were prepared for Dworshak and Kooskia NFH's. These data, in conjunction with IDFG and Nez Perce Tribe information, is used to set fishing seasons and future hatchery production plans.

19. Flood Project

We assessed the effects of the 1995/1996 winter floods on aquatic habitat in managed (timber harvested) and unmanaged (unharvested) watersheds with

funding through the Emergency Watershed Protection Program. U.S. Forest Service stream inventories, completed in 1994 and 1995, were used to establish pre-flood conditions in selected stream reaches for the following habitat attributes: 1) large woody debris (LWD) density, 2) acting debris density, 3) primary pool numbers, 4) cobble embeddedness in riffles, 5) percent surface fines, and 6) median substrate particle size (D50). Post flood conditions were determined for these same habitat attributes by re-surveying those stream reaches in 1997. Generally, we observed a decrease in LWD and acting debris densities, cobble embeddedness, and percent surface fines, while increases in primary pool numbers and D50 were seen. Overall, observed changes in unmanaged stream reaches were more pronounced than those in managed reaches. Significant decreases ($P \leq 0.05$) were detected in LWD densities in unmanaged reaches, and acting debris densities in constrained reaches (managed and unmanaged). A significant increase ($P \leq 0.05$) in primary pools was observed in unmanaged reaches. Only one resurveyed managed stream had reaches with unlogged riparian areas, and it changed similarly to unmanaged streams. Logged riparian areas appeared to create channel conditions where instream complexity was due to logging debris and dense riparian shrubs rather than large woody debris and late seral canopies as observed in unmanaged areas. In managed streams, we observed low wood densities prior to the flood, early seral/dense shrub riparian conditions, and an associated lack of large wood recruitment during flood flows. These combined conditions were prevalent in managed stream reaches, and appeared to minimize pre and post flood differences in the habitat attributes we examined.

20. Data Compilation

Idaho FRO has responsibility for data review for all three federal hatcheries in Idaho. We archive distribution data and computerize return data as well as develop summary files.

Additionally, our office has developed a PIT-tag database that provides release and interrogation information for chinook and steelhead released from Dworshak and Kooskia NFHs. Currently, data is available back to 1988. We have pooled these data with other agencies, such as the Idaho Department of Fish and Game, and NMFS. This is part of an effort to build a large database and begin developing multi-variate regression models that will relate factors such as flow, time of release, size at release, migration time, and survival. This database can also be used to compare return rates of various tag groups (CWT, PIT, freeze brand) to determine effects of the various marks on adult return.

21. Idaho FRO personnel participated on the following committees and study teams in FY96:

a. Member of the outplanting subcommittee to establish priority, numbers, and places for outplanting steelhead fingerlings, smolts, adults, and spring chinook fingerlings from Dworshak and Kooskia NFHs.
b. We assist in planning tagging, branding, and clipping work at the various hatcheries, particularly Dworshak and Kooskia NFHs.
c. Member of Idaho Supplementation TAC. As a member of this committee, we review and provide technical guidance on developing Idaho supplementation projects. We also participate by sampling two study streams in the Idaho Supplementation Studies program.
d. Pacific States Marine Fishery Commission/Pacific Salmon Commission. We contribute to their regional coded-wire tag database for release and recovery data as well as advise the mark committee on sample design and policy.
e. Instructor to the Services' motor boat operator training course.
f. Members on the Dworshak-Kooskia Hatchery Evaluation Team
g. Member of the Hagerman Hatchery Evaluation Team
h. Participated on the Watershed Enhancement Teams for Potlatch, Mission-Lapwai, and Bedrock Creeks.
i. Member on the TAT on bull trout for the Clearwater Basin Advisory Group.

22. Dworshak Local Area Network

Dworshak Fisheries Complex was the modeling site for the Region 1 Medium Local Area Network (LAN) pilot project. This was the first medium size LAN installed in the region capable of supporting up to 40 users. During the past three years, the complex has experienced a significant increase in number of computer users. There was an increasing interest in consolidating and sharing computer resources complex wide and enhancing our communications capabilities. Planning for the project, which began in December 1996, resulted in a medium LAN design that is currently being implemented region wide. After preliminary planning and installation of fiber optic, Category 5 cable, and network interface cards, the Regional Office System Design, Development, and Maintenance (SDDM) Team traveled to the Idaho and formal deployment of the pilot project occurred in May. To support the network and users we also hired a Computer Assistant in May. Since the inception of the network the Computer Assistant has gained considerable Windows NT knowledge and troubleshooting abilities. Several software enhancements have been made to the file server to enhance performance and user computer hardware technology has been upgraded considerably. The SDDM considers the Dworshak LAN to be an ongoing project. The team continues to monitor the project for new information and other issues that can be used at ongoing and future LAN installations and provide viable solutions to technical issues related to the LAN.

Station Cost Summary

With the continued high level of our staff, projects, and other activities, expenditures for FY97 remained basically the same as FY96.

A major expenditure in FY97 continued to be the lease of a modular office building to accommodate our staff. The complex added a LAN which was cost-shared between our office, the hatchery, and the lab. We added two Pentium desktop computers, plus several other upgrades to existing ADP systems and software.

One new project was started and another began a new phase, both of these required radio-tracking equipment which is expensive.

Major Purchase Cost Summary:

Computer Equip.	33,150
Electronic fish measuring board	4,686
Lease of 1995 Bronco	4,224
Helicopter flights	4,987
Jet pump for boat	6,400
Pump installation (2 boats)	7,337
Radio tags	12,569
Radio tracking antennas	2,042
Telemetry housings	1,400
Hydrological davit	2,096
Boat safety equipment	1,358
Computer Survival modeling	2,000
Clear Creek Trap Contract	3,840
Telemetry datalogger	9,475
Attennas and associated equipment	1,250
Manual Tracking receiver	4,875
Radio tags	8,924

Future Outlook

Idaho FRO will continue to function as a key player in the complex problems stemming from anadromous salmonid production and management in the Snake River Basin. The outlook continues to be greater demand for fewer resources by more users. Also, there is the omnipresent requisite for agencies to do more with less.

The Idaho FRO has been part of the Dworshak Fisheries Complex since January 1995. The change has not been drastic or rapid, but changes for the better are occurring. Greater sharing of personnel throughout the Complex has provided all sections with help during their critical times. Also the management direction of Region 1 continues to be "Eco-Region" oriented, and therefore our office has increased, and will likely continue to increase, cooperative projects with Ecological Services and Refuges.

The listing of steelhead has the potential to change our steelhead program. Off-site releases to all sites will be closely monitored, if they are allowed to continue. Also promoting steelhead smoltification will continue to be a major concern. We will continue to document Dworshak NFH steelhead production and contributions by providing information to states, tribes, and others concerning seasons, CWT, PIT-tag, and freeze brand data.

We will continue our evaluation of chinook and steelhead production at Dworshak and Kooskia NFHs to determine how the Service can best meet their goals. Currently a number of projects are awaiting final adult returns before assessment. We will also continue our work with Hagerman NFH by providing technical assistance through our involvement with the Hagerman Hatchery Evaluation Team.

We will also continue to evaluate hatchery supplementation and natural production of spring chinook salmon through the BPA funded Idaho Supplementation Studies. Our office will also continue to be involved in ESA salmon and steelhead issues with the preparation and finalization of Recovery Plans. We foresee the potential for more time to be spent on ESA issues, with the proposed bull trout listing and other petitions that have been filed.

Our study on Snake River fall chinook has shifted to supplementation and survival research. This cooperative research includes NMFS, Nez Perce Tribe, USGS-Biological Resource Division (the agency formerly known as NBS), WDFW, and Idaho Power Company. We are currently working on preparing several scientific publications on the past fall chinook work. We will be implementing the radio tracking project following adult returnees from yearling fall chinook releases in the Snake and Clearwater rivers. From the information we gain in these new projects and publications we will continue in our role as the experts on fall chinook in the Snake River Basin.

III. APPENDICES